12.

22 SEP 1938

ANNUAL REPORT

OF THE

SUDAN VETERINARY SERVICE

1937.

LONDON SCHOOL OF
LIBRARY
22 SEP

CONTENTS

Page

Staff 1

SECTION I

Diseases of Animals 2

SECTION II

Trade in Livestock and Livestock Products..... 8

SECTION III

Improvement of Livestock... 15

SECTION IV

Education 19

SECTION V

Miscellaneous.... 20

APPENDIX

Report of the Senior Research Officer 22

* * *

STAFF.

The distribution of the British staff at the end of the year was as follows:-

NAME	DESIGNATION	STATION
Captain H.B. Williams, O.B.E., M.R.C.V.S.	Director	Khartoum
Dr. S.C.J. Bennett, D.Sc., M.R.C.V.S.	Asst. Director and Senior Research Officer	Khartoum
Mr. J.T.R. Evans, B.Sc., M.R.C.V.S.	Veterinary Research Officer	Malakal
Captain J. Going, M.R.C.V.S.	Veterinary Inspector	Khartoum
Captain C.P. Fisher, M.R.C.V.S.	"	El Obeid
Major J.R. Ellison, M.R.C.V.S.	"	Malakal
Captain T. Menzies, D.V.S.M. (Vict.), M.R.C.V.S.	"	El Fasher
Captain L.E. Prichard, O.B.E., M.R.C.V.S.	"	Wad Medani
Mr. W.H. Glanville, M.R.C.V.S.	"	Khartoum
Mr. J.E. Furney, M.R.C.V.S.	"	Wau
Mr. J.A. Gillespie, M.R.C.V.S.	"	Kassala
Mr. A.W. Chalmers, M.R.C.V.S.	"	Kosti
Mr. P. Durran, M.R.C.V.S.	"	Shendi
Mr. R.H.A. Merlen, M.R.C.V.S.	"	Wad Medani
Mr. J.D.M. Jack, M.R.C.V.S.	"	El Obeid
Mr. H.A. McLoghry	Superintendent	Khartoum
Mr. P.A.C. Kenny, F.R.M.S.	Laboratory Assistant	Khartoum
Mr. C.B. Barrett	Chief Storekeeper	Khartoum

With a view to easing the abnormal situation foreseen for 1939/40 when several Veterinary Inspectors become due for retirement, approval was obtained for the appointment of a Veterinary Inspector to be carried supernumerary to the present establishment. This appointment allowed the posting of a Veterinary Inspector to Shendi

/to perform

to perform Sudan Defence Force and Civil duties which the Veterinary Inspector, Khartoum, on account of additional educational work, could no longer carry out.

Mr. J.D.M. Jack, M.R.C.V.S., engaged on first appointment on 18.10.1937, was posted to Kordofan Province in relief of Mr. Durran, who was posted to Shendi.

The Director visited the following Provinces in the course of the year:- Northern, Blue Nile, White Nile, Darfur and Kordofan.

SECTION I.

DISEASES OF ANIMALS.

1. DISEASES OF CATTLE.

Rinderpest.

Following the epizootic character of last year's outbreaks, when a wave of rinderpest of a virulent type swept across the Northern Sudan, conditions were normal, and provincial veterinary staffs were once more able to cope with outbreaks as they occurred, thus ensuring that losses were not excessive in those areas where conservation of bovine lives was justified on economic grounds. The single exception was the Southern District of Darfur where, owing to the continued epizootic nature of outbreaks, demands for prophylactics could not be completely met.

In 1934, when the Malakal Laboratory had attained its maximum output of serum, it was found necessary, in view of rapidly increasing demands, to introduce a specific scale of allotment. The principle adopted was to consider the claims of individual provinces and to earmark the main bulk of the season's serum before preparation, allowing for a small central reserve to be held at Headquarters. Veterinary Inspectors were thus for the first time in a position to know in advance the quantity of serum that would normally be supplied to them, and were enabled, in view of their local knowledge, to arrange for its most equitable expenditure. In addition it was arranged that the newly introduced vaccine, prepared by the Khartoum Laboratory, should be used as a supplementary central reserve and issued to meet additional requirements.

In spite of the issue of 124,000 doses of serum and 130,000 doses of vaccine in 1936, demands outstripped production and the whole system of allotment has had to be revised. The new feature introduced is that henceforward an allotment of vaccine as well as serum will be made, thus informing each Province in advance of its annual ration, subject always to the possibility of receiving a small emergency supplement from the central reserve.

The question of whether there is any justification for increasing the output of cattle plague prophylactics above the 1936 level, which is the maximum that can be turned out in any year with existing facilities, was referred to Governors and Veterinary Inspectors. Replies would indicate that there is a growing feeling that many of our richest pastoral areas are already stocked to as full a capacity as is desirable and, although no precise information over a period of years is obtainable on this point, heavy losses recorded in many of these areas during the dry season of dry years would point to this being the case. On the other hand, although instances of understocking were reported from the Southern Provinces, the economic value of cattle in such areas is a doubtful quantity and these alone would not appear to justify the large capital and recurrent expenditure which would be involved if our output of sera and vaccine were increased to any marked extent.

Therefore, for the present, it would seem advisable to continue our policy of merely 'ironing out' the waves and troughs of periodic cattle plague epizootics and maintaining the cattle population at its present level; the question of effecting any increase can be deferred until such time as we have collected more precise information on the size of our herds and the carrying capacity of our grazing lands.

Contagious Bovine Pleuro-pneumonia.

Returns of outbreaks show a marked improvement on those rendered for some years previously. Of the 31,763 head vaccinated, only 17,302 represented cattle in the 86 herds in which outbreaks of the disease occurred; the remaining 14,461 were vaccinated as a routine prophylactic measure to safeguard our trade routes.

Except in the case of Kassala Province, where the only cases reported occurred in a small consignment of slaughter cattle from Kordofan, all Provinces reported small scattered outbreaks which were suppressed by the prompt use of vaccine and slaughter of infected beasts.

Digitized by the Internet Archive
in 2019 with funding from
Wellcome Library

https://archive.org/details/b31497500

Foot-and-Mouth Diseases.

This disease has been widespread in Darfur, Kordofan, White Nile and Upper Nile Provinces. Its benign nature in the pastoral areas has, however, allowed of most outbreaks passing unnoticed, and in those that were reported no deaths were attributed to it.

Except in relation to the export cattle trade, foot-and-mouth disease is of little economic importance in the Sudan.

Anthrax.

No positive case was reported.

Anaplasmosis.

Four cases were reported from the Blue Nile Province, of which only one recovered following treatment by "Akiron". The others, however, were very debilitated when brought under treatment.

Trypanosomiasis.

The usual small percentage of cases was reported amongst herds grazing on the fringe of the tse-tse fly areas in Southern Provinces. In Aweil District the disease is called "Jong Alel" (Ironstone sickness), a name which appears to imply that the Dinka realises that infection takes place when his cattle come into contact with fly on the ironstone areas where they are commonly found.

The disease was diagnosed in native owned cattle at Beila, Galbi and Balos in Gedaref District. Deaths numbered eighty out of herds totalling 675 head. The Veterinary Inspector, Kassala, discussed the outbreaks with the owners, and found that they realised they had acted foolishly in staying too late in dangerous fly areas. They recognised the disease as being fly-borne.

Mange.

The Veterinary Inspector, Blue Nile Province, states that psoroptic mange is still the chief scourge amongst working bulls in the Gezira cotton area. Treatment is only recommended in the case of those mildly affected, slaughter being always resorted to in the case of those suffering from extensive lesions.

Two cases occurred in the Wau dairy herd.

2. DISEASES OF CAMELS.

Trypanosomiasis.

The Veterinary Inspector, Kassala, reports as follows on the Eastern Arab Corps camels:-

> "The results of the heavy 1936 infection "were apparent early in the year. The camels of "No. 1 Company were in such poor condition that "they did not proceed on manoeuvres to the Fung "District. The baggage camels of the Infantry "Companies which have sufferred in the previous "year from heavy infection contracted in the Kassala "grazing area provided many casualties. These "animals, although treated and retested, had to be "constantly employed and were not again retested "as were the camels of No. 1 Company.
>
> "As it was felt that reinfection was taking "place in the rainy season on the grazing grounds "near Kassala, a scheme of prophylactic naganol "injection was instituted this summer. All Eastern "Arab Corps camels were treated on three occasions - "the injections were given in June, August and "Spetember."

The usual crop of cases occurred amongst Police camels employed in areas where transmitting flies are to be found in the rains. Prompt use of naganol reduced casualties to a minimum.

Over 12,900 camels were treated with naganol during the year, and of these 10,813, the highest number so far recorded, were native-owned camels treated on payment. From figures received it would appear that the popularity of naganol is waning in the Eastern and growing in the Western Sudan, but the fact that a smaller number of doses than usual was sold in Kassala Province, where treatment on a large scale was first initiated, may be largely attributed to abnormal demands for camels at the end of 1936 from nearby export markets where purchasers took little trouble to ascertain whether the purchases were fly-free or not. This enabled sellers to dispose of many doubtful camels.

Contagious Necrosis.

A considerable number of camels of No. 5 Company Eastern Arab Corps contracted the disease during the rains, but by December all had completely recovered. A few mild cases also occurred amongst Police and Officials camels in Darfur Province.

Mange.

No case was reported in No. 5 Company Eastern

Arab Corps, which is the sole remaining Unit in the Sudan Defence Force with a large establishment of camels. Cases in Police and other Government-owned camels were few, and no serious outbreak was reported.

3. DISEASES OF EQUINES.

African Horse Sickness.

Despite the good rains experienced in all horse-breeding areas the mortality from African Horse Sickness during the period under review is the smallest recorded for some years.

The success of the "neuro-vaccine" obtained from Kenya, recorded last year was further proved in this year's report on vaccinations in the Gezira, where, of the 342 vaccinated, only two horses succumbed to the disease whereas considerable losses occurred in unvaccinated animals.

Epizootic Lymphangitis.

The disease was diagnosed at the Veterinary Research Laboratory from material forwarded from 19 horses and 19 mules.

There were twenty cases in Fung District, chiefly at Roseires and Kurmuk. At the latter place, where the majority of animals bacame infected, it is difficult to keep the Police animals from coming in contact with cases of epizootic lymphangitis occurring in mules bearing merchandise from Abyssinia, since the Police are largely employed in controlling this trade.

The Veterinary Inspector in charge of the Sudan Horse reports that:- "After the return of the Unit from Kurmuk in April, cases commenced to appear at Shendi and continued until November, since when no fresh one has been reported. Of the 19 animals which contracted the disease all except one showed eye lesions."

No reason can be found for so large a percentage of these cases showing initial eye lesions. The outbreak is being investigated by a Veterinary Inspector recently appointed to Shendi for permanent duty.

It is pleasing to note that only one case was reported from Kordofan, in marked contrast to conditions prevailing up to a few years ago when the horse-rearing tribes of Western Kordofan annually suffered heavy losses from the disease.

Strangles.

Remount horses arriving from Darfur early in the year developed strangles en route and spread infection to the Sudan Horse animals at Shendi, where a few cases occurred.

A mild form occurs amongst young stock in all horse-breeding areas, but no casualities are said to result from it.

4. DISEASES OF CANINES.

Rabies.

The brains of 155 animals were submitted to the Stack Memorial Research Laboratory for diagnosis. Of the 44 cases among animals found to be positive, 27 were dogs, 9 donkeys, 4 cattle, 1 camel, 1 horse, 1 mule and 1 sheep.

During the year under the review much has been done in the heavily populated and more closely administered areas to encourage the destruction of stray and uncared-for dogs. In many districts the response to propaganda for the destruction of these unwanted animals has been unexpectedly good. The imposition of a heavy licence in the cases of Khartoum, Omdurman, Khartoum North and villages in the near vicinity of these towns has proved most satisfactory as a means of eliminating uncared-for mongrels from the streets of these towns.

The following table shows the seasonal and topographical distribution of the positive cases:-

Province	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Blue Nile	4	1	-	2	2	4	3	1	-	-	-	1	18
Northern	2		-	-	-	-	-	-	-	-	1	-	3
Kordofan	1	1	1	-	2	-	-	-	-	1	-	-	6
Equatoria	1	-	1	-	-	-	-	-	-	-	1	1	4
Khartoum	-	1	1	-	-	1	1	-	-	-	-	2	6
Upper Nile	-	-	-	-	1	-	-	-	-	-	-	-	1
Kassala	-	-	-	-	1	-	-	-	1	-	2	1	5
White Nile	-	-	-	-	-	-	-	-	1	-	-	-	1
Total	8	3	3	2	6	5	4	1	2	1	4	5	44

SECTION II.

TRADE IN LIVESTOCK & LIVESTOCK PRODUCTS.

1. EXPORT & IMPORT TRADE.

Cattle and Sheep.

Total exports of cattle via Wadi Halfa and Port Sudan, at 8,985, showed a decline of 1,486 compared with 1936, but in virtue of the better prices obtained their value was only £. 421 less.

Demands from Egypt were steady and good prices were obtainable on the Cairo and Alexandria markets. Unfortunately, in October, when Egypt could supply few cattle herself and her need for our cattle was therefore greatest, an outbreak of foot-and-mouth disease occurred at El Obeid and spread to Kosti. This necessitated the closing down of trade for a period of over a month and its restriction for a considerably longer period as, until it was proved that export centres were completely free from the disease, export was limited to consignments of cattle known to have recovered.

In late August a cattle merchant arrived from Palestine to obtain first-hand information on the quality of our cattle and see whether it would be possible to partly supply Palestine's demands for beef by importing cattle from this country. At the time of his arrival Sudan cattle could not be shipped to Palestine, since under the Palestine Animal Diseases Ordinance (Animal Quarantine Rules) certificates stating that the cattle came from districts which had been free of certain diseases for lengthy periods were demanded. These certificates could not be supplied. With the arrival of another merchant buying commenced, and in October information was received from the Ministry of Agriculture, Palestine, to the effect that amendments had been made in the Animal Quarantine Rules which allowed of Sudan cattle being admitted without the certificates previously referred to, provided certain quarantine measures were adopted in place of them.

The first consignment destined for Palestine unfortunately developed foot-and-mouth disease in quarantine and its departure was delayed for some weeks.

In all, three consignments totalling 898 head, were shipped from Port Sudan to Haifa.

Just as it seemed possible that a small regular trade might develop between this country and Palestine, cases of contagious bovine pleuro-pneumonia were detected in Palestine slaughterhouses amongst cattle from the third consignment. This occurrence was not unforeseen and the possibility that "lungers" might filter through was previously pointed out to the Palestine Veterinary Authorities.

Although reliable figures are not available it is believed that some 10,000 cattle were traded on hoof to neighbouring states in addition to those exported via Wadi Halfa and Port Sudan.

The cattle grazing areas of Kordofan and Darfur experienced exceptionally good rains, which produced an abundance of grass. This was particularly noticeable and welcome in the near vicinity of El Obeid, where owing to its being the rail head of stock from the West, there is a bigger concentration of cattle, from July to December, than on any other pasturage in the Sudan. The excellent condition of the cattle arriving from there during the latter half of the year showed how good the grazing was.

The fact that only 5,417 sheep, valued at £.5,359, were exported to Egypt should not be taken as indicating a decrease in demand for our sheep on the Egyptian markets, but rather as reflecting the more prosperous conditions prevailing in this country. Another year of favourable rains produced large crops of agricultural products which realised good prices on export markets.

As was the case last year those people, happily situated in cattle and sheep rearing country, where agricultural products are also readily grown, have been able to obtain all the money they need from the sale of gum, durra and sesame without having had to market the usual number of animals from the seasonal increase in their flocks and herds. Signs of overstocking are already apparent in some of these areas. This holding of stock, coupled with the fact that a general increase in prosperity of the country caused a marked rise in local consumption of meat, particularly mutton, tended to keep prices at too high a level to allow of sheep being profitably exported in large numbers to Egypt.

Further details of the trade in cattle and sheep are given in the following tabulated statements:-

A. Numbers and values of cattle and sheep exported during the last four years.

Year	Cattle	Sheep	Value at Port of export
1934	8,963	15,642	£. 50,311
1935	14,596	21,568	84,765
1936	10,471	11,110	56,517
1937	8,985	5,417	49,729

B. Numbers of cattle imported during the last four years.

Year	French Equatorial Africa	Eritrea	Abyssinia	Total
1934	3,437	-	821	4,258
1935	5,764	-	1,662	7,426
1936	1,754	-	1,181	2,935
1937	1,754	-	171	1,925

C. Origin of cattle exported during the last three years.

Province	1935	1936	1937
Kordofan & Darfur........	5,684	6,088	6,118
White Nile	3,300	1,721	1,044
Upper Nile & Equatoria....	1,144	338	-
Khartoum..................	480	198	202
Blue Nile.................	200	347	-
Northern..................	2,100	1,400	1,945
Kassala...................	-	13	-

D. Average market prices and total number of cattle sold for export in El Obeid market during the last four years.

Year	Number of cattle sold	Average Price
1934	1,789	£. 1.810 m/ms
1935	6,759	2.087
1936	7,002	2.333
1937	7,651	2.365

Camels.

The camel-owning tribes of Darfur, Kordofan, Blue Nile and Kassala Provinces again found a ready market in Egypt for their seasonal surplus of animals of both slaughter and transport types.

Sales totalling over 27,000 included animals of all ages and types, from the two-year-old male to the prime fat barren naga, and prices ranged between £.3 and £.12. During the early months of the year trade was exceptionally brisk, and by the end of June nearly 16,000 head had been sold, but, as usual, few animals were forthcoming for sale during the period July-September, when conditions for man and beast are at their worst on the desert routes which the camel caravans have to cross on their way to the Egyptian markets. Even the higher prices prevailing on account of this lack of supply do not then tempt camel owners to face the hardships and risks of desert travel.

It is estimated that 70% of the camels forwarded to Egypt eventually come on the market in Cairo and that the other 30% are sold and absorbed locally in Upper Egypt.

Following good rains in the camel raising areas and easy conditions on the routes to Egypt, those arriving for sale from October to December were said to have been in exceptionally good condition.

Hides and Skins.

The increased demand for hides and consequent rise in prices noted during the last quarter of 1936 continued throughout 1937.

The value of hides exported, at 1,828½ tons worth £.116,667, exceeded the £.100,000 mark for the first time since 1928.

Egypt, with purchases totalling 963 tons, remains our best customer, whilst Syria with 520 tons takes second place. Greece, taking 72 tons, has for the first time made large purchases.

Since the slump of 1929 and until the rise in prices registered last autumn, the low values prevailing on local markets have limited export to hides produced in areas readily tapped by rail or steamer. This year, however, a continuance of good prices has enabled the trade to use motor and animal transport over long distances to exploit the more remote pastoral areas.

In view of the relatively small amount of cattle disease present in the country during the year, the opportunity was taken of instituting a general campaign of propaganda and demonstration in improved methods of hide curing in the pastoral areas of the Northern Sudan. As it was considered that Veterinary Inspectors might not always have material available to ensure that their own subordinate staffs were highly trained in the procedure

to be demonstrated, it was arranged to have selected stockmen sent to Khartoum for instruction. On their return, these selected men were immediately employed at Province Headquarters stations in instructing the remainder of the Province stockmen. All stockmen on returning to their districts were instructed to pass on their knowledge, primarily to tribal retainers, and, as opportunity occurred, to all cattle owners, stressing the fact that they were popularising an approved government process from which not only the producers but the country also would ultimately benefit.

Possibly owing to the rapidity with which hides lose moisture in the dry air of the Northern Sudan, drying by suspension from horizontal poles, as is done in other African trritories, has not proved as successful as the frame method. Hides dried by suspension show marked corrugation, and curling at the edges; faults which do not occur in the case of frame-dried ones.

Boom conditions prevailed in the sheepskin market for the first five months of the year. Export values reached their highest level in April, when 128,147 kilos valued at £.18,015 were exported. In May there was a slight falling off in demand and prices gradually declined until early June, when, owing to unsettled conditions in the American market, values slumped heavily. From then until the end of the year the market, influenced by the continued trade depression in America, remained weak.

As a result of over-keen competitive buying by agents of certain exporting firms, skins were at one period being purchased at prices which could not possibly have allowed of a remunerative return to the export businesses concerned. In February and March the best skins sold at up to 35 P.T. each.

There has been a steady demand for goatskins, and prices improved during the first half of the year, but fell away slightly during the latter half. America and Egypt, with 81⅓ tons and 18 tons respectively, were our best customers.

A total of 1,048 tons of sheepskins of a value of £.109,994, and 157 tons of goatskins of a value of £.17,614, were exported via Wadi Halfa and Port Sudan.

Those closely connected with the trade cannot fail to have noticed a marked increase in the percentage of well prepared hides marketed during the past twelve months, but the primary producer cannot expect to receive higher prices from the very moment of his beginning to improve his technique. The ultimate judge is the tanner in the country to which the hides are exported, and it is not until he has become aware of the existence of improved Sudan hides that he will make enquiries about them. His demand will then have to work its way back to Khartoum exporters, and through them to their agents in

the Provinces before any appreciable rise in prices in local markets will occur. Appreciation of this fact makes it clear that nothing short of sustained effort over a considerable period will benefit the primary producer, but once his reputation is established he will automatically continue to reap the benefit of his industry.

Samn (Clarified Butter).

Exports of approximately 546 meteric tons valued at £. 31,001 were appreciably lower than last year's totals of 707 tons valued at £. 38,428. Since production has been normal and local prices have remained steady, the decrease in exports points to increased purchases on the home markets for internal consumption, a further proof of the more prosperous times prevailing in this country. Egypt and Eritrea, with approximately 367 and 162 tons respectively, remained our best customers. The following table shows the destination of Samn exported:-

Countries to which exported	Kilos	Value
		£.
Great Britain..........	1,015	72
Egypt.................	367,363	21,903
Eritrea................	161,657	8,017
Arabia.................	610	37
Cyprus.................	522	29
British India...........	924	56
Abyssinia..............	7,173	525
Belgian Congo..........	6,441	362
Total.......	545,705	31,001

Sheep Casings.

There has been a brisk demand for sheep casings for the export market. The chief sources of supply are the slaughterhouses of the larger towns. Exports totalled 9¾ tons, of which Egypt took almost 9.

II. INTERNAL TRADE.

Official returns of animals killed for food at slaughterhouses in the ten largest towns in the Sudan

show that, while the number of camels and goats killed remained approximately the same as last year, there was an increase of 14,489 in the case of sheep and a decrease of 2,023 in the case of cattle.

Prices ruled higher than in 1936 and when in May, June and July there was a shortage of cattle in Khartoum, Khartoum North and Omdurman as much as £.8 was given for a fat sagia-fed bull.

The increase in slaughterings of sheep and goats for family consumption commented on last year still continues. It is satisfactory to note that under the prosperous conditions now prevailing the labouring classes have more money to spend on meat, and are thus better able to satisfy the craving for additional proteins which their usual ill-balances diet creates.

Arrivals of sheep at Omdurman, the chief market for sheep from Northern Kordofan and Darfur, have been steady throughout the year, and except for a slight shortage in June and July, when it is always difficult to travel sheep, all demand were met with animals in prime condition.

Numbers of animals slaughtered during 1937 in the following ten large towns:-

	Camels	Cattle	Sheep	Goats
Khartoum........	40	3,116	35,191	77
Khartoum North..	-	698	11,056	148
Omdurman........	197	5,265	43,387	1,349
Wad Medani......	777	2,144	20,803	292
El Obeid........	245	4,809	15,033	278
Atbara..........	50	1,234	14,931	6
Kassala.........	382	450	14,115	514
Gedaref.........	317	1,252	5,847	160
Port Sudan......	202	973	21,119	4,721
Wadi Halfa......	2	299	4,340	125
Total...	2,212	20,240	185,822	7,670

SECTION III.

IMPROVEMENT OF LIVESTOCK.

Cattle.

The report of the Royal Commission on Agriculture in India (1928), strongly condemns the short-sighted policy, frequently adopted by those who have no special qualification for their work, of crossing indigenous breeds with imported stock in order to obtain some form of quick result, and this applies in the Sudan.

A thorough knowledge of local conditions, in respect (a) of the natural resistance of the breeding stock towards enzootic disease, (b) of whether or no there are sufficient foodstuffs available to support an improved type of animal and (c) of how far conservation of fodder could be arranged for to supplement grazing and also to carry the breeding stock through the dry hot-weather period, is essential in this country of a million square miles, with pastoral areas in which the annual rain-fall varies from one to over sixty inches, before any policy involving the importation of stock to improve a local breed can be embarked on with reasonable hope of success.

The conditions in many of our pastoral areas are such that, unless increased watering facilities can be provided or the head of stock carried limited, the improvement of existing breeds should be undertaken with some caution. The stock-carrying capacity of any area in the Sudan can only be estimated on observations extending over a period of years, since assessment must be largely based on conditions prevailing during the driest season of an exceptionally dry year, and it is only when this is known that improvement should be contemplated.

A marked example of how improved environment has naturally brought about an up-grading of stock occurs in the case of many of the herds to be found in the Southern District of White Nile Sub-Province. During the Khalifa's regime the cattle population of this District was reduced to a few thousand, but when times became more prosperous cattle were brought in from such places as Rufaa and distant breeding areas on the Atbara which, owing to their remoteness, had suffered little from the ravages of war. The descendants of these cattle are much finer animals than those to be seen in the areas from which their forebears came. This up-grading has been chiefly brought about by the easier grazing conditions prevailing in the Southern District during the hot weather period, compared with those of Rufaa and the Atbara, where poorer soil and a lower rainfall combine to produce less abundant pasturage.

In most of our pastoral areas normal growth of young stock is greatly retarded, or even practically ceases, during the March-May period of shortage, and, since the people of these areas are nomadic, no method of conserving fodder to tide their animals over these months can be successfully exploited.

Sheep

The long-legged haired sheep bred by the Kababish of Northern Kordofan is undoubtedly the best type of sheep to be found in the Sudan both as regards mutton and skin producing qualities. Those found in the Butana area of Kassala Province, though identical in appearance (conformation and colour) never grow to quite the same size, whilst those from the Northern District of Darfur, where pastoral conditions appear very similar to those under which the Kababish sheep are raised, are markedly smaller.

Recent inquiries instituted amongst sheep owners would appear to show that good milking strains exist in many flocks and that some care is taken to ensure that these strains are kept pure. A good milking ewe (third lambing) seen in the Butana in January was yielding over three pounds of milk daily. From what could be gathered from conversations with the sheep owners the best milkers lambing in the early rains give the astonishing yield of from 6-7 pounds daily for a period of up to three months. This seasonal high yield of milk is turned to good account in the Butana where all surplus is made into samn which finds a ready sale at Kassala and Gedaref.

Not only are the rams carefully selected on conformation and parentage, but services are also restricted to a certain period of the year to ensure that lambing takes place at the most favourable season.

If breeding were unrestricted, two crops of lambs would be produced yearly, but experience has taught the Arab sheep rearers that if this were allowed under conditions prevailing in their sheep country, too great a strain would be placed on the ewes and the stock would consequently deteriorate; therefore they wisely only permit lambing to take place once a year.

Horses.

A review of the results of the breeding scheme since its institution in 1925, followed by discussions with Governors in whose Provinces the scheme operates, led to certain modifications in policy being adopted this year.

One conclusion arrived at after twelve years' experience of breeding from Arab stallions is that while a certain amount of Arab blood is beneficial, too high a proportion thereof leads to the production of a horse that either does not thrive under Sudan conditions or is not entirely suitable for the purposes for which it is required. Thus, although large numbers of half-bred Arabs are seen at the annual horse shows, disappointingly small proportions of them are subsequently seen when the time comes for them to be purchased for work, and the higher the proportion of imported blood the less appear to be the chances of surviving to maturity. Moreover, there has been a tendency for the best stock, especially mares, to be exported from their normal breeding areas to the riverain districts in order to be mated with thoroughbred stallions for the production of nothing short of a racing machine, which can only be reared and maintained at considerable cost under highly artificial conditions.

In future our policy will aim at a wider diffusion of a smaller proportion of Arab blood. This will be effected by maintaining a smaller, but more select, number of Arab sires, by conserving the best of their male progeny for use as "tribal stallions" instead of allowing them to be purchased as remounts, and by discouraging the export of good mares from the natural breeding areas. Furthermore, it is not intended to replace casualties amongst thoroughbred stallions in riverain stations.

As an inducement to native owners to give their good mares preferential treatment, and in order further to compensate them for closing the riverain markets to them, it is proposed to pay a small annual subsidy to the owner of each selected mare which is produced in good condition and in foal to a stallion at his appropriate show.

In Darfur it is intended that an establishment of six Government-owned Arab and forty-five half-bred tribal stallions should be aimed at. Up to the end of the year there were nineteen of the latter, and further purchases will be made at the January, 1938, shows.

The Senior Veterinary Inspector, Darfur Province, remarks on the exceptionally fine condition in which both young stock and mature animals were produced at the 1937 horse shows. In addition to good grazing, many of the youngsters were receiving a liberal ration of cow's milk.

A total of nearly 14,000 animals were on parade at the four principal Darfur shows. At Sibdu and Abu Salaa over 2,400 mares were shown in different classes, of which 42 were selected for special subsidies under the scheme of earmarking selected mares for mating with Arab sires.

Many more male horses were brought in for sale at these shows than was expected, and owners had spared no pains to produce them in "fat stock" condition. Quite a number of those seen would have caught the judge's eye in any pony class in England. One realises they are small, but this is largely offset by their hardiness, cheapness and tractability (frequently played polo a few weeks after purchase). They

make excellent little polo ponies, with the minimum of schooling, if kept to their own class, but the majority soon become soured by being called upon to compete with heavier and faster imported horses.

The Senior Veterinary Inspector, Kordofan Province, reports that arrangements were made in December to put out on premium, as tribal stallions, four of the Government-owned sires previously fed, syced ans stabled at Government expense. The saving effected in the cost of upkeep will be utilised in increasing the number of tribal stallions.

Two of the three stallions stationed at Muglad suffered from osteomalacia, which was found to be due to a lime deficiency in local grasses. One recovered on being given a course of bone meal but the other had to be destroyed.

The breeding scheme sustained a great loss in June by the death of Malek, a grey Arab stallion presented to the Sudan Government by Lady Stack in 1925. Malek, a magnificent specimen of Arab, was imported into the Sudan from Saudi Arabia about 1920, and during his racing career at Khartoum won most of the principal races open to his breed. At stud he was equally successful as a sire of racing and polo ponies. He was a big-framed horse himself, and his progeny too when properly fed and cared for invariably showed size, bone and quality.

Oberto, an English thoroughbred by Lemberg-Chaunt, foaled in 1916 and presented to the Sudan Government by Lord Astor in 1928, was destroyed in December on account of old age. He was a prolific sire and his progeny are noted for their good conformation and racing capabilities; qualities with which he invariable endowed his stock. During the past years his stock competed with remarkable success on Sudan race-courses and in 1936 alone they won 21 out of the 69 races run in the Sudan; a remarkable achievement.

SECTION IV

EDUCATION

In conformity with a comprehensive system of higher education formulated by the late Director of Education, the Veterinary Service has undertaken to extend its efforts by establishing a small veterinary school in Khartoum.

The only veterinary education hitherto undertaken is that recorded in last year's Report, namely, the training, mainly by apprenticeship, of potential Animal Husbandry Officers. The new scheme provides for a full course of veterinary instruction, the successful students in which should attain a frankly professional standard.

With a view to starting teaching early in 1938, some loose-boxes in the Veterinary Hospital, and three other small buildings in an adjacent yard previously occupied by the Medical Service, have been reconditioned and equipped to constitute the actual school; a syllabus with a heavy bias towards Sudan requirements has been drafted, and concurrently three ex-Gordon College boys, additional to those who would normally have been admitted for the requirements of the Medical Service, have been selected for entrance into the Kitchener School of Medicine, where they have undergone the first-year course of instruction in chemistry, physics and biology. Of the students who pass the end-of-year examination, three are to be selected for a further three years' course in the Veterinary School.

The school was, by the end of the year, ready to take the students over, and, although there are still some outstanding details of organisation to be settled, instruction should start early in 1938. In consideration, however, of the factors still at issue, further details of the proposed course cannot be given at the present moment.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

SECTION V.

MISCELLANEOUS.

Grazing and Water.

Except in a few isolated instances the abundant and well-spaced rainfall of 1936, as last year, provided excellent grazing for animals in the pastoral areas. Northern Province, in addition to experiencing good rains, benefited from a high Nile which flooded basins where good pasturage sprang up as the waters receded.

Stocking up to the maximum that Northern districts can support in these years of good grazing raises false hopes of the carrying capacity of the land and, as yet, it is quite impossible to make the Arab pastoralist, a "fatalist", realise that he would suffer much less pecuniary loss if he restricted his flocks and did not allow of these abnormal increases, which in years of adverse conditions inevitably bring in their wake not only heavy casualties from starvation, but also a setback in normal growth from which the surviving young stock never fully recover.

Veterinary Hospital.

The following cases were treated during the year :-

Khartoum Civil Veterinary Hospital and Forge :-

Out-patients	10,665
In-patients	7,996
Pairs of shoes fitted..........	3,333
Pairs of shoes removed..........	813
Rasping of feet, etc............	927

Wad Medani Civil Veterinary Hospital :-

Out-patients.....................	10,207
In-patients.....................	610

An instructional course is held annually at the forge for training Sudan Defence Force and Sudan Government police farriers. This course is followed by an examination at which certificates are awarded to successful candidates. Holders of these certificates are entitled to extra technical allowances when employed as farriers in their Units.

Government Animals :-

The following table shows the number of animals for which forage allowance was drawn, and the approximate percentage wastage from deaths and castings throughout the year :-

Horses.......	1,191	Wastage	11%
Camels.......	935	"	14%
Mules........	515	"	10%
Donkeys......	630	"	2%

The wastage may be considered normal for a year when grazing conditions were easy. Reports from Veterinary Inspectors in charge show that the general health of the above animals was good, as also was that of the 142 horses, 76 camels, 283 mules, 112 donkeys and 587 bulls owned by the Government in the Provinces.

Sudan Defence Force Animals.

The establishment of animals at the end of 1937 was :-

1,272 horses, 516 mules, 251 camels, 15 donkeys and 54 bulls; a total of 2,108.

With the exception of the outbreak of epizootic lymphangitis at Shendi, previously referred to in this Report, all the Army animals were singularly free of disease and their condition was reported to be good throughout the year.

Acknowledgments.

It is again a pleasure to record an appreciation of the assistance that has been given to the Veterinary Service by Provincial staffs and Departments, when called upon. This help has in a great measure contributed to any success that has attended the efforts to control disease and further the employment of improved methods of preparing certain animal products.

Sgd. H.B. Williams

DIRECTOR, VETERINARY SERVICE

ANNUAL REPORT OF THE
SENIOR RESEARCH OFFICER,
SUDAN VETERINARY SERVICE
FOR 1937

A. STAFF AND GENERAL

No changes have been made in the constitution or distribution of the classified staff.

Two vacancies in the unclassified technical staff of the Malakal Veterinary Laboratory were filled by recruiting southerners. With the increased output of cattle plague serum, it has been found necessary to ask for the institution of two further unclassified technical posts at Malakal in 1938. If sanctioned, attempts will be made to fill the vacancies with suitable southerners.

No changes have occurred in the routine work, while research, which cannot be pursued without an increase in superior staff, has remained almost entirely in abeyance.

A few structural alterations were effected at the Malakal Laboratory. Two rooms were added on account of additional work and, owing to the laboratory's proximity to the aerodrome, the living quarters of the technical staff had to be removed to the necessary distance to comply with the prescribed "anti-amaryl" measures.

B. ROUTINE WORK

The largest single item, namely the preparation of cattle plague serum, has, as usual, been conducted at Malakal, whence also comes a large proportion of the raw material used in preparing cattle plague vaccine. The remainder of the routine work is carried out in Khartoum. The following are reports on the individual items :-

I. CATTLE PLAGUE SERUM

An attempt was made to prepare 6,250 litres (125,000 full doses of 50 c.c.). It was, however, only found possible to prepare 119,232 doses, for reasons which will be apparent from the following remarks :-

The main limiting factor was a shortage of cattle. In order to produce the full quantity of serum in the time available, about 600 large beasts are required as serum producers, and in addition at least 500 small cattle, susceptible to cattle plague, for use as virus producers and serum test subjects. These numbers have to be adjusted according to the size of the cattle, and, in the case of the small cattle, also according to the proportion which proves to be immune to cattle plague. Ultimately only 520 serum producers were obtainable, and of these over 200 had to be imported from outside the Upper Nile Province (all, actually, from Equatoria Province). The situation in regard to small cattle (virus producers) was even more troublesome. Actually

just over 500 were obtained within the Upper Nile Province, but owing to their small size and to the fact that an unusually high proportion proved immune to cattle plague, approximately 300 more were needed, and, as these could not be obtained in the Upper Nile Province, they had to be obtained elsewhere (nearly all from Kosti). A small outbreak of cattle plague, although soon suppressed, at one time aggravated matters. Nevertheless, serum production was never delayed through shortage of virus producers.

It is always objectionable, for general reasons, to have to search far afield for cattle, but this season a new petty annoyance developed. With a fair number of immune cattle among the prospective virus producers, the question of their disposal arose, as they were too small to be worth the trouble of employing as serum producers. If cattle of local origin only are involved, there is little difficulty in exchanging them for others, but the local natives have no great liking for "foreign" cattle, even if known to be immune, because they are not of a popular type. The disposal of the surplus small cattle therefore entailed appreciable loss.

Towards the end of the year, work on production for the 1938 season was again considerably hindered owing to shortage of cattle. The supply of large beasts was adequate, but the shortage of small ones became so acute at an early stage that consignments had to be hurriedly ordered from Kosti. Here, unfortunately, both cattle plague and foot-and-mouth disease were present, and, in spite of all precautions, both diseases were transported to Malakal with laboratory cattle. Ultimately casualties were not heavy, and the diseases did not spread beyond the laboratory, but considerable inconvenience and delay were entailed.

Labour was on the whole adequate, although the local cattle men could not forego their routine annual strike. A threatened strike early in the year, when local public works of some magnitude were in progress, was avoided by a temporary increase in wages in order to bring the cattle men into line with other labourers. The subsequent resumption of the ordinary wage rate induced a few individuals to inspire a strike. With the dismissal of a few malcontents, the remainder cheerfully resumed work at the usual rates of pay.

Conditions otherwise were favourable, although grazing was none too plentiful towards the end of the dry season.

II. CATTLE PLAGUE VACCINE

Last year, for the first time, all available "raw material" was converted into vaccine. A large proportion of this originated in the Malakal Veterinary Laboratory, where the lymphoidal tissues of bled-out virus producers were collected and roughly processed before being sent to Khartoum for final treatment. The technique of preparation has in no way changed from that described in last year's Report.

A second source of raw material became available early in the year when the Medical Service undertook the local preparation of small-pox vaccine. In theory, young cattle purchased by the Lee Stack Memorial (medical) Laboratory are passed on to the Veterinary Laboratory after having been used for lymph production, and, subject to their intervening use for any other purpose for which they may be required, they are infected with cattle plague and utilised for cattle plague vaccine preparation. In practice the Veterinary Laboratory maintains a common pool of cattle, on which both laboratories draw as required; the ultimate fate of all beasts, however, is to be infected with cattle plague. In virtue of this additional source of supply, it has rarely been necessary to purchase beasts specially for cattle plague work, and in years of small demand for cattle plague vaccine the material becoming available from the Malakal Veterinary Laboratory and the Lee Stack Memorial Laboratory might even suffice for the whole country's requirements.

The taking over of lymph-producing cattle has led to some interesting observations that may probably not be already on record. The first is that a second period of fever, with a temperature curve similar to that recorded during the original vaccinia reaction, is very frequently observed about a week after the termination of the former. This temperature reaction cannot be correlated to the severity of the initial thermal reaction or to the degree of local reaction as gauged by the yield of lymph. A few of the cattle also develop swellings in various parts of the body due to the accummulation of serous exudate in the subcutaneous areolar tissue; one such beast was so severely affected that it had to be destroyed. Finally, a few beasts, after recession of the secondary temperature reaction and of subcutaneous swellings, are, when infected and ultimately slaughtered for cattle plague vaccine production, found to be appreciably jaundiced. Occasionally a small pocket of yellowish exudate is found in an unexpected site in loose areolar tissue, and on rare occasions (so far only three seen in over 100 cases) an unusual lemon-yellow colour suffuses all the connective tissues of the body. In the three cases observed, the colour was quite unlike that seen in cases of piroplasmosis or spirochaetosis, neither of which infections could be detected by microscopic examination. Material was sent to the Lee Stack Memorial Laboratory, since the phenomenon is primary of medical, rather than veterinary, interest. These phenomena may not be rare, but it is probable that they may not have come to notice because lymph-producing cattle are not usually slaughtered and submitted to post-mortem examination during about the third week after vaccinia infection.

Demands for cattle plague vaccine were rather lighter than last year, issues dropping from 130,723 to 103,090 doses.

III. CATTLE PLAGUE VIRUS

This year, for the first time, cattle plague virus has been issued in significant quantities. In the past, negligible quantities of virus have been issued, confined to the immediate neighbourhood of Khartoum, the chief limiting factor being the difficulty of supplying a virus that would remain sufficiently potent after the conclusion of a long journey for it to be usefully employed for serum-simultaneous immunisation in the field. Citrated virulent blood, the most commonly used form of virus, is not suited to Sudan conditions because it loses its potency, even in cold storage, within about two days, and, although it may arrive at its primary destination within a good deal less than this interval, it is rarely possible actually to get it injected soon enough for reliance to be placed on its action.

With the knowledge that glycerinised lymphoidal tissue pulp retains its virulence for several weeks in cold storage, this difficulty can to a considerable extent be overcome. A stock of tissue virus can be dispatched to a centre in vacuum flasks, and, provided some form of cold storage is available at the centre, the stock can be further stored and drawn on, as required, for a week or two at least. This procedure has so far only been adopted in the Blue Nile Province, where about 6,000 cattle belonging to tenants of the Sudan Plantations Syndicate and the Kassala Cotton Company have been immunised.

IV. CONTAGIOUS BOVINE PLEURO-PNEUMONIA VACCINE

Demands for this product have been lower than usual, 29,635 doses having been issued as compared with over 50,000 in each of the two preceding years. No accidents have been recorded following its issue.

V. CAMEL TRYPANOSOMIASIS CONTROL

Diagnosis by the mercuric chloride test and treatment with naganol have continued. Demands for diagnostic materials and for naganol have continued to increase, 12,938 doses of the latter having been issued as compared with 10,701 in 1936. Of these 11,285 were to private owners who paid for treatment. In 1936 the number was 8,854.

Very little new information has come to light regarding the naganol treatment of camels. On the whole it appears to continue successful, but, as recorded in this Report for 1935, there are undoubtedly some camels which are difficult to cure, even with repeated large doses of the drug. One particular case that occurred during the year is worth recording. This camel was successively given 5 gm., 5 gm. and 10 gm. of naganol, none of which doses succeeded in clearing the blood of trypanosomes for more than three weeks. After

the 10 gm. dose it was not further treated and has since been lost sight of. Such cases are undoubtedly rare, but nevertheless they occur, and it is unfortunate that one has no time to study them further.

VI. AFRICAN HORSE SICKNESS

No original work has been carried out, but vaccination with neuro-vaccine prepared in Kenya has been continued. Altogether 360 horses were vaccinated, of which 18 were Government-owned stallions and 342 privately-owned horses. Three privately-owned horses subsequently died of horse sickness, one being in Khartoum and the other two in the Blue Nile Province. All had been vaccinated several weeks before contracting the disease, and had therefore had ample time in which to develop immunity. Even if these cases represent true failures of the vaccine, the losses cannot be considered excessive, but there is the further possibility that a strain or strains of virus not incorporated in the vaccine may be at issue. Samples of virus from all three fatal cases were sent to Kenya for study, but no report on them had been received by the end of the year.

VII. EXAMINATION OF SPECIMENS

A total of 636 specimens from outside sources was examined. As usual, most of these were of no particular interest, but one group of diagnoses is worthy of record. This group consisted of a series of 18 cryptococcus infections, all affecting the conjunctiva, which occurred in a military unit over a period of about eight months. Only two non-conjunctival cases occurred in the unit over the period. As can be seen from earlier Reports, conjunctival infections with cryptococci are by no means rare, but it is exceptional to encounter a long series of cases such as that just described.

Miscellaneous, less interesting, diagnoses included :-

Horses	:	*Tryp.congolense*, *Tryp.brucei*, *Babesia caballi* epizootic lymphangitis, habronemic granuloma, microfilaria in blood, ringworm, various septic infections.
Mules	:	Epizootic lymphangitis, various septic infections.
Donkeys	:	*Babesia caballi*, microfilaria in blood, ringworm, septic infections.
Cattle	:	*Tryp.congolense*, *Theileria* infection, haemorrhagic septicaemia, septic infections.
Camels	:	*Tryp.evansi*, septic infections.

VIII. CLARIFIED BUTTER PREPARATION

An attempt was made during the year to investigate the practicability of employing the "direct" method of preparing clarified butter, following the technique originally introduced by the Department of Veterinary Science and Animal Husbandry in Tanganyika Territory. Clarified butter (samn) in the pastoral areas of the Sudan is only prepared in large quantities in the rainy season, which is the only period during which the milk yield of cattle is markedly in excess of the immediate requirements of calves and owners. Hitherto it has all been prepared by individual owners by the usual native method of churning sour milk and boiling the resultant butter as and when a quantity worth boiling accummulates. The product varies in quality in different districts, but all of it is relatively inferior. The degree of inferiority, chiefly due to rancidity, can be roughly gauged by realising that in Egypt, to which the bulk of the Sudan's exportable surplus finds its way, the price of Sudan clarified butter is almost exactly half that of the Egyptian native-made product.

The "direct" method aims at eliminating the butter making stage by separating cream from milk with a mechanical separator, "washing" the cream by mixing with water and again passing through a separator (in order to remove nearly all the non-fatty solids), and finally boiling the washed cream.

In Tanganyika Territory the "direct" process is exploited by Government-owned factories, which are erected in favourable areas and which operate during a large portion of the year. In the Sudan it is intended to leave development to private enterprise, but it has been realised that, before embarking on the venture, intending operators would need some data concerning the conditions under which their efforts would most likely be successful. After a few trials in the laboratory, in order to reassure oneself on details of technique, the services of two Veterinary Inspectors, in Kordofan and White Nile Provinces, were therefore enlisted in order to carry out field trials.

The success or otherwise of a unit will naturally depend on the purchase price of fresh milk and on the turnover. The lowest price of milk was approximately determined in advance by the price that natives were already obtaining for their own clarified butter, and the problem for study thus resolved itself into ascertaining how the shorter working season, and the lower concentration and greater mobility of cattle, would entail modification of the procedure as carried out in Tanganyika. In addition there was also the task of overcoming the innate conservatism of the pastorals among whom one hoped to work.

Operations were conducted in two centres specially selected as being typical of the more promising areas that might later be exploited. The observations in both centres were the same, and afforded very useful information, the main items being as follows :-

(i) The purchase price of milk should not exceed one millieme per rotl (approximately one farthing per pound).

(ii) A clarifying unit cannot profitably operate for more than about four months of the year, starting when the rains are established.

(iii) In order to compensate for the short working season, it is necessary to draw on a relatively large number of milking cows. At least 1,000 pounds, and preferably at least 1,200 pounds, of milk a day should be forthcoming. This will produce from 60 to 70 pounds of butterfat. The number of milking cows which will yield this surplus will vary in different districts, but in the best areas at the height of the season at least 400 milking cows should be available.

(iv) A most important point : in order to exploit an area to the full, a butterfat plant should be mobile, since even at the peak of the rains, when cattle movement is at its minimum, there is always a certain amount of local ranging over the rainy-season grazing grounds. In order to maintain contact with one's cattle, a move of a few miles every three or four weeks will generally be necessary.

The above conditions are only obtainable in a limited number of centres and it seems certain that a large proportion of Sudan butterfat will continue to be prepared by the original native method. Nevertheless a sufficient quantity of the improved product should be forthcoming to satisfy the needs of such local inhabitants as are willing to pay a higher price for a more wholesome foodstuff, and it is quite possible that, in time, an exportable surplus may appear.

Samples of locally prepared butterfat made by the "direct" method were sent to the Imperial Institute in London for examination, and a report was received assessing it as equal to the highest quality yet examined from any source. If, therefore, an exportable surplus comes on the market, there will be no danger of not disposing of it at remunerative prices.

As the result of this year's trials, it is realised that attempts can conscientiously be made - and such are being made - to interest private traders in the process. Officials of the Veterinary Service who have had practical experience in operating a plant will be available to give advice and supervision.

C. RESEARCH

Deliberate technical research is still in abeyance, but one item of immediate practical interest had to be investigated.

The point at issue concerned the technique of hyperimmunising cattle for the production of cattle plague serum, and in particular the saving of time which is so essential if full advantage is to be taken of the short season during which it is possible to prepare this product.

As has frequently been recorded, it is only in the southern Sudan that serum can be economically prepared, on account of the necessity for having grazing available for as long a period as possible. In areas carrying sufficient grass for an adequate period, however, climatic conditions (rain and floods) make it impossible to work for much more than half the year. The saving of time, especially in starting work at the beginning of each season, is therefore as important as any technical factor involved in the process if the maximum output is to be attained.

In order to save time at the beginning of a season, prospective serum producing cattle are largely purchased towards the end of the preceding season, but they have to be herded at some distance from the laboratory in order to conserve the grazing in the immediate vicinity thereof for the next working season. Although infection with cattle plague is improbable during the storage period (the rainy season), the consequences of its introduction would be so disastrous that all cattle are immunised as soon as possible after purchase. Until two years ago, i.e. before it was known that a single dose of the type of vaccine evolved in this country produced an immunity in most individuals of about a year's duration, all laboratory cattle had to be immunised by the serum-virus method. This entailed either long journeys to numerous centres at which the cattle were purchased, with the trouble of handling one's virus, or alternatively driving the cattle to the laboratory in Malakal for immunisation and then returning them to their wet-season grazing grounds. Following the determination of the properties of the new vaccine, this laborious procedure has for two seasons been superseded by vaccination at the time and place of purchase. This operation, however, although it has saved a good deal of initial trouble, has been open to the objection that although immunity in vaccinated cattle is usually sufficiently sound to withstand natural infection for about a year, there has been no certainty that it would not be broken down by the large doses of virus administered when instituting hyperimmunisation. Pending determination of this point, all serum producers re-collected after the rains have had to be submitted to a preliminary serum-virus immunisation, with a consequent waste of time.

Two series of experiments were therefore designed in order to settle this point. The first series, carried out in Khartoum, consisted in vaccinating a herd of cattle with a single dose of vaccine, and at intervals thereafter

testing the immunity of a number of beasts in the face of a "small" (1 c.c. per beast) and a "large" (1.5 c.c. per lb. weight of beast) dose of virus. The result was that up to a period of a year after vaccination - the longest period for which one can usually rely on the vaccine in any circumstances whatsoever - there was evidently no more to be feared from the administration of a large dose of virus than from a small one.
The second series, carried out at Malakal, consisted in taking a fair number of cattle vaccinated the previous season (say in June) and hyperimmunising them without further interference at the commencement of the current season (say in late November or December). Actually 69 cattle were so treated, of which 60 developed no untoward symptoms, five developed mild symptoms of cattle plague and rapidly recovered, and three died of cattle plague. One beast also developed symptoms of an indeterminate nature. It is thus evident that when hyperimmunising considerable numbers of vaccinated cattle at several months' interval after vaccination, a few casualties are to be expected. It seems, however, that these are unlikely to represent more than four or five per cent. of the total, and, in consideration of the circumstances in which serum has to be prepared in the Sudan, this small loss is abundantly justified by the saving of time entailed.

A paper incorporating full details of these experiments is in the press.

D. PUBLICATIONS.

Two papers have been published in scientific journals during the year (including one nominally published in 1936, but not recorded in last year's Report) :-

1. BENNETT, S.C.J. Toleration of Naganol (Bayer 205) by horses - Jour.Comp.Path. & Therap., 1936, Vol.49, pp.304-9.

2. HOARE, C.A. and BENNETT, S.C.J. Morphological and Taxonomic Studies on Mammalian Trypanosomes. III. Spontaneous Occurrence of Strains of *Trypanosoma evansi* devoid of the Kinetonucleus - Parasitology, 1937, Vol.29, pp. 43-56.

E. SUMMARY

The usual routine duties continued. Demands for most laboratory products fell slightly, but demands for naganol, especially for the treatment on payment of privately-owned camels, showed a considerable increase. A few more specimens were also examined.

Cattle plague virus was issued for the first time on an appreciable scale, for "simultaneous" immunisation or working cattle in the Blue Nile Province against cattle plague.

In collaboration with members of the field staff, some local observations were made of the conditions under which it would be possible to carry out the "direct" process of clarified butterfat production. As a result it is thought that the potentialities and limitations of the process in the Sudan have been fairly accurately gauged, and the information obtained has been passed on to private individuals who would be likely to exploit it.

The only item of technical research undertaken was the investigation of the possibility of hyper-immunising cattle with cattle plague virus at several months' interval after simple vaccination. It was found that this could be effected with very small losses which would be easily justified by a saving of time in serum making technique, with a resultant larger output in our limited working season.

Two papers were published in scientific journals.

Sgd. S.C.J. Bennett
SENIOR RESEARCH OFFICER
Sudan Veterinary Service

Khartoum,
16th Feb.,1938.

LONDON SCHOOL OF HYGIENE & TROPICAL MEDICINE
LIBRARY
22 SEP 1938